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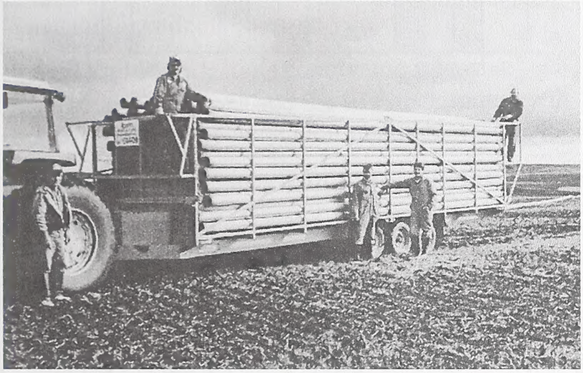
THE Engineering In Agriculture NEWSLETTER

SPRING 2000

Water Pumping Program Stepped Up

Murray Tenove, Water Quality Engineer, Edmonton



Many parts of the province have experienced several years of extremely dry weather conditions that have had a negative impact on water supplies and storage systems for livestock. As part of an assistance package to stressed farmers, the Water Pumping Program, operated by the Agricultural Engineering Branch of Alberta Agriculture, Food and Rural Development (AAFRD), received a $2 million injection to improve its ability to respond to water shortages experienced by farmers. The added investment will increase the program's pumping capabilities by approximately 30 percent.

The Water Pumping Program currently maintains an inventory of 6 and 8-inch aluminum pipe, trailers, and water pumps that are available for rent by farmers who need to fill depleted dugouts used for domestic and livestock purposes. Early each spring, the dugout situation in the province is assessed and the fleet is distributed to the six hubs within the province where a 2 - 3 person team coordinates and delivers equipment to the clients. This year, the regular program got off to an early start (March 20) to take advantage of some spring snowmelt opportunities.

To access the equipment, clients can contact any Alberta Agriculture District Office or one of the closest dispatch locations in the province. They are required to fill out an application and leave a deposit. Basic information about the pumping project is collected, along with the date the client would like the equipment delivered. Any questions the renter has can also be answered. Clients are required to provide the tractor to power the pump and people to lay down and pick up the pipe.

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Alberta
AGRICULTURE, FOOD AND
RURAL DEVELOPMENT
Engineering Services

Printed on Recycled Paper

The purpose of this newsletter is to advise of activities and projects being conducted by Alberta Agriculture, Food and Rural Development's Agricultural Engineering staff. For further information on these projects and other engineering related activities contact:

Lethbridge	(403) 381-5112	Airdrie	(403) 948-8525
Red Deer	(403) 340-5322	Vegreville	(780) 632-5400
Barrhead	(780) 674- 8256	Fairview	(780) 835-2291
Edmonton (Agricultural Eng.)	(780) 427-2181	Lethbridge (AFMRC)	(403) 329-1212

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Depending on the level of activity, equipment may arrive within a few days or on a date arranged with the coordinator. Typically, peak demand occurs in the fall, so if possible, pumping over the summer is encouraged. When multiple applications are received in one area, there can be an advantage for neighbouring farmers to coordinate their projects together. This is highly recommended. However, extra lead time is required to make this happen.

As this year has the potential to be a very busy water pumping year, farmers requiring access to the equipment are encouraged to apply as soon as possible. All district offices and dispatch locations can be contacted toll free through the provincial RITE Line by dialing 310-0000. Program details can also be viewed on the AAFRD "Ropin' the Web" internet site at: www.agric.gov.ab.ca/navigation/engineering/water/index.html.
The main dispatch locations are:

Lethbridge	(403) 381-5112
Airdrie	(403) 948-8503
Red Deer	(403) 340-5322
Vermilion	(780) 853-8113
Barrhead	(780) 674-8256
Fairview	(780) 835-2291

Note: Some Counties in the Peace River region can provide equipment, but users must provide their own equipment transportation.

Row Spacing Results

Lawrence Papworth, Project Engineer, AFMRC, Lethbridge

The Alberta Farm Machinery Research Centre (AFMRC) continued its work on the Row Spacing project during 1999. Canola and wheat plots were seeded at Lethbridge, Blackie, Stony Plain, and Provost. The Barton double shoot angle disk opener was used for seeding at row spacings of 8, 10 and 12 inches, at three different seed rates.

Results from 1999 show a trend of decreased crop yields with increased row spacing. Figures 1 and 2 show wheat and canola yields at the various row spacings. At six of the seven crop sites, the 8-inch row spacing produced significantly higher yields than the 12-inch row spacing. Seed rates did not affect the yield of the crops. The project will continue this year.

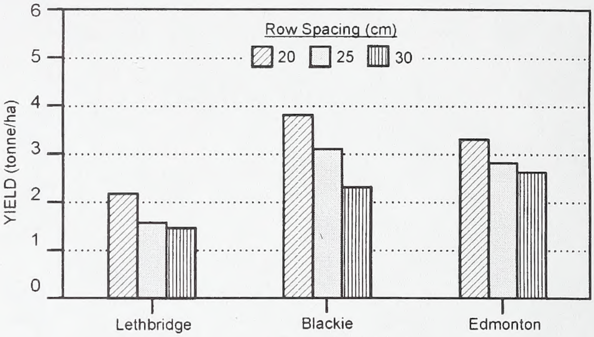

Figure 1. Effect of Row Spacing on wheat Yield

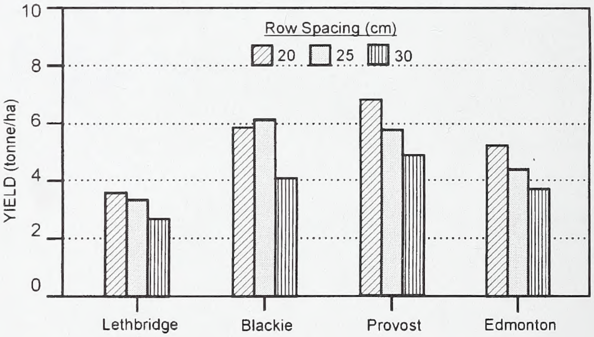

Figure 2. Effect of Row Spacing on Canola Yield

Cooperators for the project were Gateway Research Organization, Alberta Reduced Tillage Initiative, Southern Applied Research Association, Agricultural Service Board of the M.D. of Provost, Flexi-coil, and Canbra Foods. The major sponsor of the project was the Alberta Conservation Tillage Society, through the Canada Adaption Rural Development Fund.

Intensive Livestock Operations Web Site

Suzanne Randall, ILO Information Specialist, Red Deer

With the growth of any industry, issues arise. Intensive livestock operations are no exception. To encourage environmentally sound and socially acceptable development of the livestock industry in Alberta, providing information to producers, municipalities, governments, and rural communities is key. This information is now accessible to everyone through the Intensive Livestock Operations Web Site.

The site houses information on the following topics:

- the **Technical Services Division** - the branches and staff available to assist you;
- **Acts and Regulations** concerning intensive livestock operations and the livestock industry in Alberta;
- **Environmental Sustainability** highlights funding programs, research projects and environmental risk assessment information relating to intensive livestock operations;
- **Industry Expansion and Development** provides information and resources on planning, site development, communication issues, water quality, socioeconomic issues and nutrient management;
- **Facilities** includes information on buildings, equipment, feeding, and handling facilities relating to the development of intensive livestock operations;
- **Newsletters** provides links to newsletters on related topics;
- **Links** to other web sites on related topics; and
- **Resources Available** to the public and how they can be accessed.

We're easy to find! Just follow these easy steps:

1. Go to **Ropin' the Web**, the Alberta Agriculture, Food and Rural Development web site at www.agric.gov.ab.ca
2. Click on **Livestock/Animals**
3. Click on **Intensive Livestock Operations**. Now you're ready to search for information!

Stay tuned! We'll be updating and adding new information on a regular basis.

We're on-line!

www.agric.ab.ca

"Branch Rebuilds"

Rick Atkins, Head, Agricultural Engineering Branch

In the last few months, Engineering has taken a serious look at what we do. Our primary functions are applied research and technology development, technology transfer, and program management. The name "Engineering Services Branch" does not accurately reflect our role. Applying science and engineering-based research and technology development for sustainable crop and livestock production, and the stewardship of resources (soil, water and air) are our primary focus. Based on these roles, and the emerging issues we face, we have decided to rename and reorganize the Branch to reflect these changing times.

Over the next few months, the Engineering Services Branch will become the "Agricultural Engineering Branch." Though this is a rather traditional name, it does reflect the scope of work in which Engineering is involved.

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A second change is the development of the Livestock Engineering work unit within the Branch. For several years, Engineering has had an Engineering Livestock Team made up of Branch and Regional engineering staff. This team developed work plans and coordinated their activities. The development of the Livestock Engineering work unit will formally put this staff together under the same branch.

Effective March 1, 2000, Robert Borg filled the position as Unit Leader for Livestock Engineering within the Agricultural Engineering Branch. Robert's 23 years of experience as a Regional Engineer and Agricultural Engineer, along with five years of research experience, will be a welcome addition to the Engineering team. His extensive experience in technology development and technology transfer will be key to leading the Livestock Engineering team to addressing current issues facing the livestock industry. Red Deer will continue to be Robert's base of operation.

Effective April 1, 2000, Kris Chawla filled the position of Technology Development Engineer within the Livestock Engineering Unit. Though this will be change in topic area for Kris, his 28 years with the department have given him experience in machinery, livestock structures, soil and water engineering, and processing. Kris has worked extensively with industry on addressing environmental issues. His experience in applied research and technology development will apply directly to this position - addressing current issues such as odour control and manure management technologies. Kris will be located in Edmonton and will work to develop close ties with researchers in the Animal Industry Division and the University of Alberta.

Completing the team will be Dennis Darby, Provincial Farm Structures Specialist and, effective April 1, 2000, the remaining two Agricultural Engineering positions in the Regions were transferred to the Agricultural Engineering Branch. This includes Wayne Winchell in Barrhead and the position in Red Deer, left vacant by Robert Borg moving into the Unit Leader position.

Bringing this expertise, experience and skills together to focus on engineering issues facing livestock production is a significant opportunity for helping the industry in meeting its expansion and sustainability goals. I look forward to working with this team under this new structure and direction.

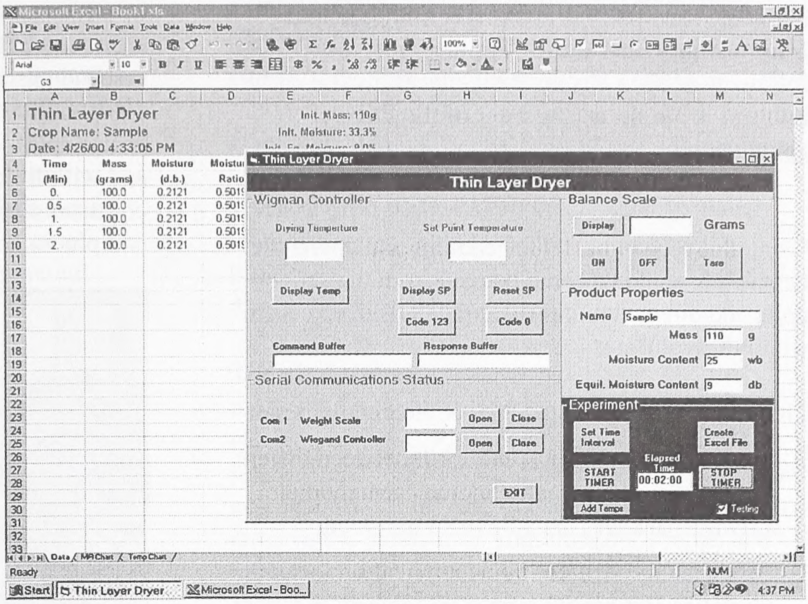
Using Integrated Software as a Monitoring Tool

Dave Scott, Systems Engineer, Edmonton

Collecting information from various sensors and instrumentation into a spreadsheet for analysis, graphing and storage can be difficult to do. Taking advantage of today's technologies of integrated software and ActiveX devices can make the process easier.

The Agricultural Value-added Engineering Centre (AVEC) has developed a thin layer dryer for testing the drying properties of various food products. The thin layer dryer consists of circular tubing, within which a fan and heating element are placed. Downstream from the fan is a platform on which a thin layer of food product is placed. The platform is connected to a weight scale. A PID (Proportional Integral Derivative) controller was incorporated into the system to control the drying temperature of the air. Information being monitored includes the dry and wet bulb temperature of the drying air, and the weight of the product.

Since numerous food products will be tested over long periods of time, the objective of this exercise was to develop an automated data collection system. This would entail having a computer collect the data from the sensors, directly import the data into a spreadsheet, instantly plot the data, and immediately save the spreadsheet to disk.



Thin Layer Dryer
Crop Name: Sample
Date: 4/26/00 4:33:05 PM
Init. Mass: 110g
Init. Moisture: 33.3%

Time (Min)	Mass (grams)	Moisture (d.b.)	Moistu Ratio
0.	100.0	0.2121	0.501
0.5	100.0	0.2121	0.501
1.	100.0	0.2121	0.501
1.5	100.0	0.2121	0.501
2.	100.0	0.2121	0.501

Com 1 Weight Scale
Com2 Wiegand Controller
Name Sample
Mass 110 g
Moisture Content 25 wb
Equil. Moisture Content 9 db
Elapsed Time 00:02:00
☑ Testing

To accomplish this, a computer program was developed using Visual Basic 6.0 and MS Excel 97. Visual Basic was used to program each of the following functions into separate modules. They are:

1. Allow the user to open or close serial communications between the computer and the PID controller and the weight scale
2. Allow the user to interrogate and to set the set point temperature of the PID controller, and to interrogate the air temperature of the drying air. A computer program that contained the necessary routines for the computer to talk to the PID controller was obtained from the vendor and incorporated into the module.
3. Allow the user to interrogate and control the weight scale.
4. Allow the user to set the time interval and duration for the sampling period.
5. Allow the user to start the spreadsheet application and create the table headings and graphs.
6. Allow the user to start and stop the timer, display the elapsed time, interrogate the instruments, and save the spreadsheet to disk after each time interval.
7. Allow the user to enter properties of the product used to calculate the moisture ratio at any time during the sampling process.

The data sampling rates required for this project could be handled over standard serial port communications lines.

MS Excel was used as the spreadsheet application because its scripting language is similar to Visual Basic. Initial attempts were made to develop the program modules strictly within MS Excel. However, VBA does not have the full capabilities of Visual Basic, especially when dealing with serial port communications and compiling the scripting language. Visual Basic 6.0 supports serial port communication and allows the program to be compiled into executable files that run substantially faster and allow for easier distribution.

ActiveX is a technology developed by Microsoft that allows data to be shared across applications. ActiveX is a standard to which any software vendors such as IBM, Corel, etc., have free access to the specifications and guidelines. The real power of ActiveX comes with gaining access to the scripting language of other applications. For example, you can write a routine in Visual Basic that will manipulate objects, such as worksheets and charts, in MS Excel. To do this in Visual Basic, the CreateObject function is used to obtain an application object. For example:

```
Dim xlSheet as Object
Set xlSheet =
    CreateObject(“Excel.Sheet”).ActiveSheet
```

These two lines of code declare the variable “xlSheet” as an object variable containing a pointer to the currently active spreadsheet in the Excel application. When executed, it will start Excel and

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allow the use of all the Excel scripting language from within Visual Basic. For example, the following code in Visual Basic places a value of "5" into cell A1 in the active sheet of the Excel application.

```
    xlSheet.Range("A1").value = 5
```

Using this technique, table headings and charts can be created, and data can be read from the serial ports and directed to the desired cells in Excel from within Visual Basic.

The advantages of using ActiveX technologies are:

1. Data can be sent back and forth between different ActiveX compliant applications. Many major software packages are ActiveX compliant.
2. Code can be written in one application to set the properties and handle events and objects in one or more external applications.
3. More efficient programs can be written in a standard programming language rather than using a scaled down scripting language of an application.
4. The functionality of multiple applications can be integrated into one solution.

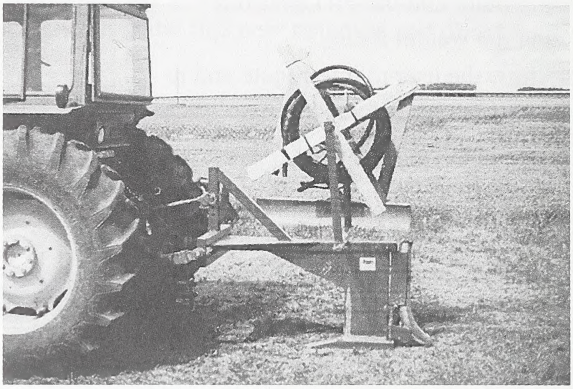
A Pasture Pipeline for Livestock Watering

Stephen Madden, Agricultural Water Specialist, Fairview

Developing new water sources (e.g., dugouts) can be costly. As pasture management systems become more intense, producers are considering piping water directly to distant quarters, rather than developing new water sources. Most often, the use of plastic line may amount to a quarter of these development costs.

Pasture pipelines are typically small diameter plastic pipes buried about 12 inches below the soil surface. They are mainly used in the summer/late fall, and are drained and blown out with an air compressor to prevent damage from freezing during the winter months.

In the past, equipment used to bury pipelines were either too large or required excessive amounts of soil and pasture reclamation after completion. In 1999, Engineering staff within AAFRD developed a pasture plow that can install pipelines inexpensively and with little effort, allowing producers to construct a pipeline system using their own equipment.



During the summer of 1999, the plow was put to the test at the Zintener farm near Woking, AB, where it was used to install approximately 7500 feet of one inch line, buried 10 - 12 inches. Their quarter was divided into three pieces (using permanent fences) and accompanied by an electric fence, which is easily moved from paddock to paddock. The line placement and design allow the Zinteners to set up intensive grazing paddocks which increases pasture utilization and manure distribution. They can rotate 50 head of cattle through each paddock every one or two days, reuse the electric fence and water trough, thus reducing overhead costs. With the line buried, they are able to graze the quarter two to three weeks longer in the fall, increasing pasture use and production.

The plow has given a boost to the development of alternative watering systems. This is extremely timely considering how this effort enhances other positive changes such as utilization of manure resources, riparian area conservation, and environmental stewardship. It is known that livestock with direct access to surface water are prone to problems with herd health, weight gain, and overall productivity (not to mention potential effects to the environment).

The pasture plow is available to producers interested in constructing a shallow pipeline system. Plow operation requires a 50-horsepower tractor, a three-point hitch and can work with ½" to 2" lines. The plow can install a 1000 foot line in 30 - 45 minutes, thereby allowing producers to install a mile of line in less then a day. Soil disturbance is reduced, increasing the speed of reclamation of disturbed areas and reducing the environmental effects of erosion.

For more information on the plow, or for assistance with pasture water systems, contact your local Agricultural Water Specialist.

Alberta Feedlot Management Guide

Robert Borg, Agricultural Engineer, Red Deer

Three years after its initial printing, the *Alberta Feedlot Management Guide* has just been revised. The new version will be out later this year, available in hard copy or CD ROM format.

A team of engineers from Alberta Agriculture, Food and Rural Development have revised the facilities and environment section. All the existing fact sheets on site selection, water supply, ground and surface water protection, feeding pen design, feedlot layouts, runoff and waste management, manure utilization, cattle handling, and corral costs were revised. As well, new fact sheets on horses for cattle handling (facility design) and composting animal manures were added.

The intensive livestock engineers and specialists contributing to the project were Brian Koberstein, Brian Kennedy, Orin Kenzie and Andy Cumming. Water specialists' contributions came from Murray Tenove, and Ken Williamson. Livestock engineering specialists also adding to the effort were Dennis Darby, Wayne Winchell and Robert Borg, along with Brian West, a former colleague and now a consultant.

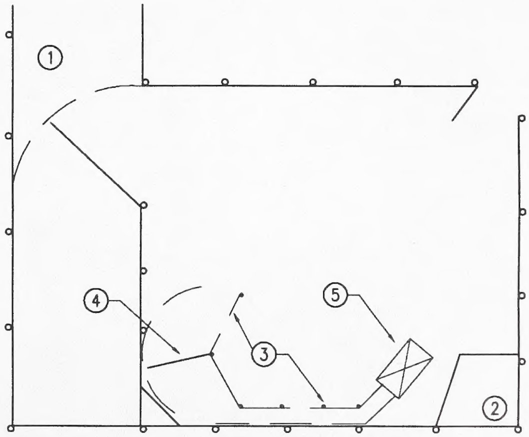
Handling Facility for Branding Calves

Dennis Darby, Farm Structures Engineer, Lethbridge

Handling small calves for branding is a difficult task with conventional cattle chutes and squeezes. These are too wide, too high, and usually longer than necessary. This plan shows a concept for building an easily removable facility with a scaled down chute for calves.

The ideal system utilizes a calf cradle, but a modified headgate and home-made squeeze panel can also be used. Pick a convenient corner of a holding pen, and make a small crowding gate, chute and squeeze for calves. The treating unit should be close to the medication and branding source, and partitioned off so a wild calf doesn't upset the works.

The chute works best with solid plywood sides; make it about 42" high, 15" wide and 8 ft. long. Attach these to temporary steel stakes driven into the ground. By adding a short 8 ft. pipe frame or plywood crowding gate, calves can be easily manipulated into the system.



1. Handling and sorting alley, 12 ft wide
2. Safe and convenient equipment area
3. Temporary steel posts, plywood panel chute
4. Crowding gate, 6 – 8 ft.
5. Calf cradle or modified squeeze

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Feedlot Runoff Calculations from Alberta Summer Storms

Robert Borg, Agricultural Engineer, Red Deer

The 2000 revision to the *Alberta Feedlot Manual* provided an opportunity to improve the information available to farmers regarding feedlot runoff volumes from summer storms. This information will be used to size runoff catch basins and to predict land areas required for irrigation of the runoff onto cropland.

A CAESA research project coordinated by Brian Kennedy, AAFRD Intensive Livestock Engineer located in Vegreville, monitored runoff from the Highland Feeders lot over several seasons. Along with pen runoff volume, the weather data (including storm intensity) has also been recorded.

Weather data from across Alberta is needed to predict runoff from other areas. Weather data, which includes rainfall from summer storms, is published in the 1997 *Alberta Building Code*. Shane Chetner, with the Conservation and Development Branch, developed Alberta maps using this weather data. From these maps, one can predict the highest amount of rainfall for one day that could occur every 1 in 30 years. Rainfall can also be determined on a township scale.

Andy Jedrych, also with Conservation and Development, used this weather data and a hydrologic model for predicting storm runoff (SWMHYMO model) to calculate runoff from a one hectare (ha) feedlot section. This model was calibrated using results from the Highland Feeders research study. The 1 ha feedlot section consisted of two feeding pens, a 16' wide drain, and a 40' wide feeding driveway. Runoff coefficients were developed to predict feedlot runoff for various storm intensities. Calculations were based on the storage capacity of the manure pack at 30 mm, and an SCS (Soil Conservation Service) curve of 0.65.

One day rainfall (1 in 30 year) probability (mm)	Runoff Coefficient
65 - 85	0.15
85 - 90	0.20
90 - 95	0.20
95 - 105	0.25

Example: A feedlot is located in an area where the 1 in 30 year, 24 hour rainfall is 90 mm. The area of the feedlot in the diagram is:

A x B = 590 m x 509 m = 30 ha.

From the table, the runoff coefficient is 0.20. Therefore the volume of liquid expected to runoff this feedlot is:

(590 m x 509 m) x 1m/1000 mm x 0.20
= 5406 cubic metres.